

Name: _____

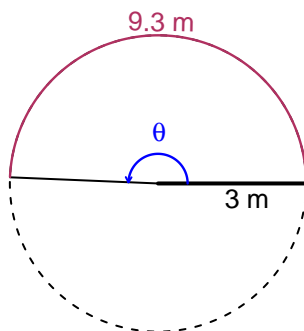
Date: _____

Trig Final (Solution v30)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 9.3 meters. The radius is 3 meters. What is the angle measure in radians?

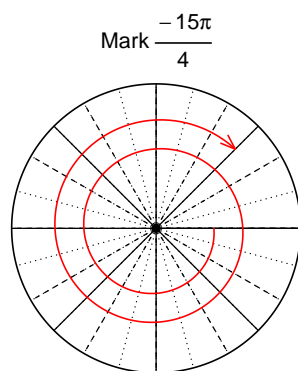


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 3.1$ radians.

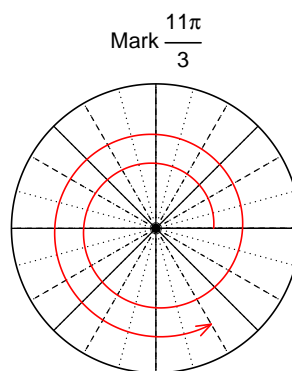
Question 2

Consider angles $-\frac{15\pi}{4}$ and $\frac{11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{15\pi}{4}\right)$ and $\cos\left(\frac{11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-15\pi/4)$

$$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$$



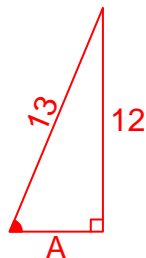
Find $\cos(11\pi/3)$

$$\cos(11\pi/3) = \frac{1}{2}$$

Question 3

If $\sin(\theta) = \frac{-12}{13}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

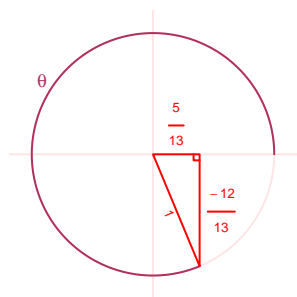
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 12^2 &= 13^2 \\A &= \sqrt{13^2 - 12^2} \\A &= 5\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-12}{13}}{\frac{5}{13}} = \frac{-12}{5}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -6.1$ meters, an amplitude of 5.02 meters, and a frequency of 3.07 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.02 \sin(2\pi 3.07t) - 6.1$$

or

$$y = 5.02 \sin(6.14\pi t) - 6.1$$

or

$$y = 5.02 \sin(19.29t) - 6.1$$